Merging a Sorted & Rotated Array and finding the pairs with a given Sum.

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Problem Statement

Write a C program to merge

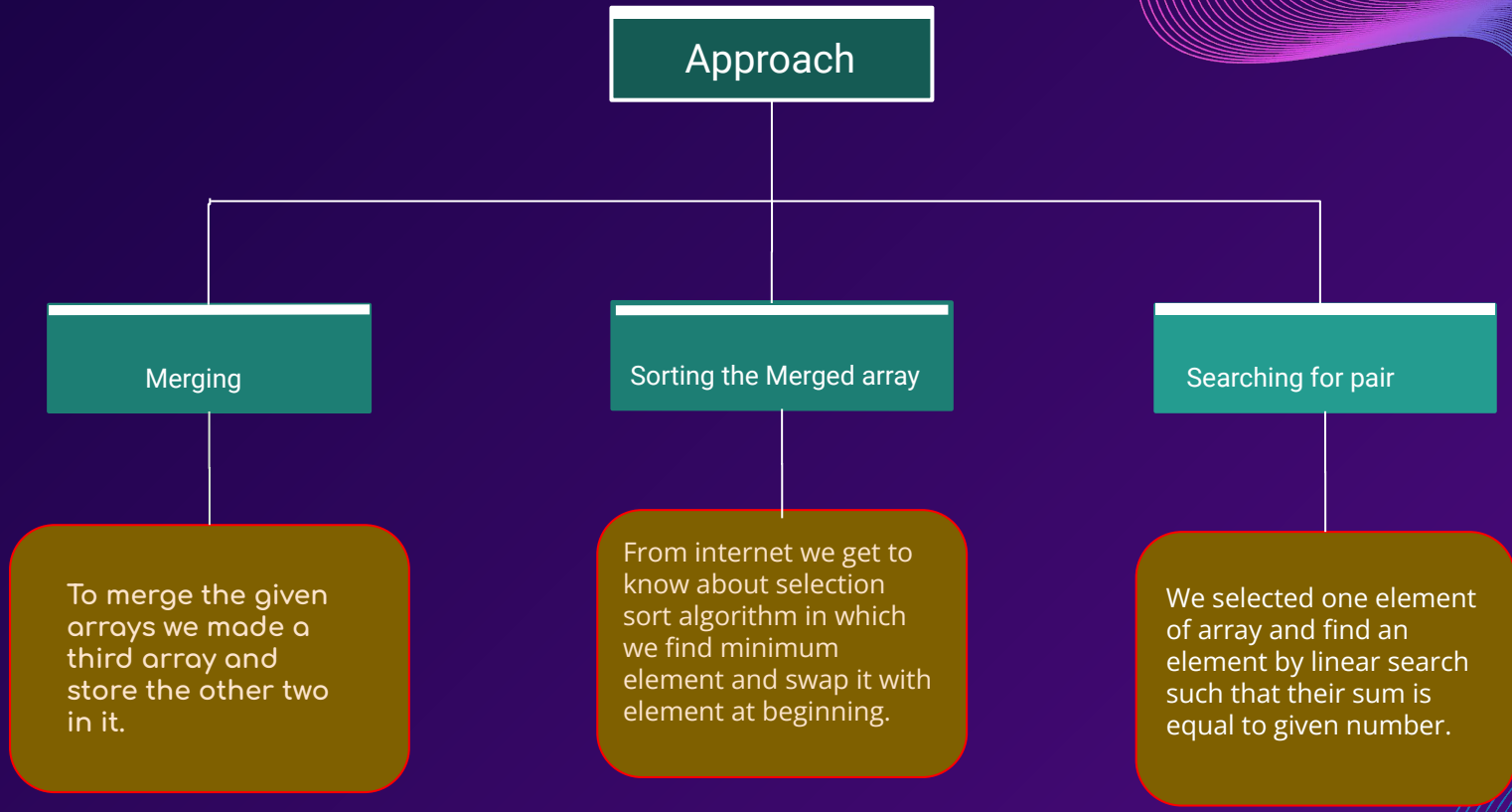
given a sorted and rotated array, find if

there is a pair with a given sum.

INTRODUCTION

We are given a sorted and rotated array and then we have to merge it and after that the problem is to check that whether there exists a pair with a given sum or not in merged array. So in this assignment we are trying to find the solution of this query.

We are Breaking the problem statement in three parts and proceeding accordingly.



Algorithm Design

We have divided the problem statement in three main parts which are as follows:

•Merging the array

•Sorting the merged array

•And finally finding the pairs with given sum

A) Merging two arrays

Firstly we are getting two arrays from user as an input.

Then we will store the contents of the two inputted arrays into a third array,

whose size is equal to the sum of sizes of original arrays.

So,like this we have merged the two original arrays into a third array

Next is the code for merging two arrays..

```
//Inputting arrays and merging them.
for(int i=0;i<m;i++)
{
   scanf("%d",&a[i]);
   c[i]=a[i];
}
int k=m;
for(int i=0;i<n;i++)
{
    scanf("%d",&b[i]);
    c[k]=b[i];
    k++;
}
```

As we can see,we have taken input as 1st array “a[m]” where ‘m’ is its size.

And at the same instance we have copied the elements into the third array “c[m+n]”.

Similarly we get the 2nd array “b[n]” as our input where ‘n’ is the size of second array.

And finally we print the merged array.

```
printf("\nThe merged array..\n");
for(int i=0;i<s;i++){
    printf("%d "" ",c[i]);
}
printf("\n");
```

B) Sorting merged array

In this part we will sort the merged array as the merged array may or

may not be sorted.So for sorting we have basically used the idea of

INSERTION SORT...

Basically we will compare the previous elements of the array with an existing element

and if the previous element is bigger than the current one then we simply

swap them(As we are sorting in ascending order).

Next is the code for sorting....

```
for(int i=0;i<s;i++)
{
    int temp;
    for(int j=i+1;j<s;j++)
    {
        if(c[i]>c[j])
        {
            temp=c[i];
            c[i]=c[j];
            c[j]=temp;
        }
    }
}
```

Here,we are using nested for loops for sort. The first loop iterates from i=0(Start of merged array) to i=s-1(End of array),where s is size of merged array i.e.s=m+n.

Inside another for loop we have used “if” conditional statement to check whether the previous element is greater than the current element and if the statement is true then we swap those elements using “temp” variable.

And finally printing the sorted array.

```
printf("\nAfter sorting...\n");
for(int i=0 ; i<s; i++)
{
    printf("%d "" ",c[i]);
}
printf("\n");
```

C) Searching the pairs with given sum

In the final part we are searching for the pairs with given sum .

So here our approach is to fix one element and then search for other elements which on addition with fixed element gives us the required sum.

We initially fix the first element of array and then proceed to fix the next elements.

Next is the code for searching pairs...

```
for(int x=0;x<s;x++){
    for(int y=x+1;y<s;y++){
        if(c[x]+c[y]==p){
            printf("[%d,%d]"" ",c[x],c[y])
            NOP++;
        }
    }
}
if(NOP!=0)
    printf("--->Pairs with given sum");
else
    printf("There exists no such pair.");
```

As described in the previous section we have fixed the first element of array initially by the help of 1st for loop.

Then the next elements are added with first element to check whether it is equal to given sum using if conditional statement.

If the condition is satisfied we print the pairs one by one.

Code Output

Input Arrays

a[5]=

30	40	50	10	20

a[2] is pivot point

b[4]=

6	8	2	4

b[1] is pivot point

Expected Output:

- Merged Array (unsorted) :

30	40	50	10	20	6	8	2	4

- Merged Array (sorted) :

2	4	6	8	10	20	30	40	50

Case1) p=10 : (2,8) (4,6) --->Pairs with given sum

Case2) p=15: There exists no such pair.

Code

```c
#include <stdio.h>

int main(){
    //Array Size Declaration
    int m,n,s,p,NOP=0;

    printf("Enter size of 1st & 2nd array:\n");
    scanf("%d %d",&m,&n);

    printf("\n");

    printf("Enter sum you want to search:\n");
    scanf("%d",&p);
  s=m+n;
    int a[m],b[n],c[s];
      //Inputting arrays and merging them.
    for(int i=0;i<m;i++)
    {
       scanf("%d",&a[i]);
       c[i]=a[i];
    }
    int k=m;
    for(int i=0;i<n;i++)
    {
        scanf("%d",&b[i]);
        c[k]=b[i];
        k++;
    }
      printf("\nThe merged array..\n");
    for(int i=0;i<s;i++){
        printf("%d "" ",c[i]);
    }
```

{

Till now the code will print unsorted merged array.

}

```
    printf("\n");

    for(int i=0;i<s;i++)
    {
        int temp;
        for(int j=i+1;j<s;j++)
        {
            if(c[i]>c[j])
            {
                temp=c[i];
                c[i]=c[j];
                c[j]=temp;
            }
        }
    }
    printf("\n");
    printf("\nAfter sorting...\n");
    for(int i=0 ; i<s; i++)
    {
        printf("%d "" ",c[i]);
    }
    printf("\n");

    for(int x=0;x<s;x++){
        for(int y=x+1;y<s;y++){
            if(c[x]+c[y]==p){
                printf("[%d,%d]"" ",c[x],c[y]);
                NOP++;
            }
        }
    }
    if(NOP!=0)
        printf("--->Pairs with given sum");
    else
        printf("There exists no such pair.");

    return 0;

}
```

{

Here the code will print the sorted array and the pairs with given sum.

}

References:

Web References:

- https://www.geeksforgeeks.org/c-program-for-given-a-sorted-and-rotated-array-find-if-there-is-a-pair-with-a-given-sum/
- https://www.geeksforgeeks.org/search-an-element-in-asorted-and-pivoted-array/
- https://www.tutorialspoint.com/check-if-an-array-issorted-and-rotated-in-cplusplus

Book References:

- Let us C by Yashavant kanetkar.
- Introduction To Algorithms by Thomas H. Cormen.

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Thank You